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450 7th Ave | 6th Floor | New York, NY 10123 | Tel 212.643.8800 | Fax 212.643.0005 | www.mside.c

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(71) Sökande *Tetra Laval Holdings & Finance SA, Pully CH*
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PATENT- OCH REGISTRERINGSVERKET
SWEDEN

Postadress/Adress
Box 5055
S-102 42 STOCKHOLM

Telefon/Phone
+46 8 782 25 00
Vx 08-782 25 00

Telex
17978
PATOREG S

Telefax
+46 8 666 02 86
08-666 02 86

PROCESS

FIELD OF THE INVENTION

The present invention relates to a process for the heat treatment of a packing. The process in accordance with the invention is especially suitable for the so-called autoclaving of packings of paper-based packing laminate.

TECHNICAL BACKGROUND

In order to extend the storage life of a product it is customary to heat-treat products and packings. The selected level of the heat treatment is based, among other things, on under which conditions the product packed in the packing is to be stored. A conventional method for carrying out a storage-extending heat treatment of a packing and a food product filled into a packing is the so-called autoclaving.

Such a storage-extending heat treatment of the packaged food can be readily carried out in the method and under the conditions described in detail in the international patent application with the publication number WO98/16431, that is incorporated herewith as reference. The packing container is placed in an autoclave and heated in it with the aid of a first circulating gaseous medium, e.g., water vapor, to a temperature that is generally in a range of 70-130°C. After a predetermined dwell time at the selected temperature the supply of the first gaseous medium is halted. The packing container is cooled thereafter with another circulating gaseous

medium, e.g., cold air, and finally with a circulating liquid medium, e.g., cold water. The cooled packing container is then removed from the autoclave for further transport and handling. The total treatment time, including the time for preheating and the time for cooling from the selected treatment temperature should be sufficient to give the current food product a desired combination of high FO value and low CO value in every individual instance. The expressions "FO value" and "CO value" are known for a person skilled in the art and refer to the time (min) that the food needs to be heated and the reference temperature (120°C) for achieving the same level of stability respectively the time the food should be warmed at a reference temperature (100°C) in order to achieve the same level of cooking effect on all the components of the food. For a person skilled in the art it is obvious that a higher treatment temperature during the autoclaving yields a higher FO value and a lower CO value than a lower treatment temperature in a corresponding autoclaving during the same total treatment time, and that an autoclaving of the packaged food should consequently be carried out at a relatively high treatment temperature in a range of 70-90°C in order to achieve the desired combination of high FO value and low CO value.

Traditionally, this type of process is used for packings of metal, glass or other material with similar moisture-barrier properties. In addition, these packings are frequently relatively rigid, which means that quite strong inner superpressures can be withstood from the product boiling in the closed packing during the autoclaving.

The autoclaving of paper-based packing laminate was introduced at a later time. In order to solve the autoclaving process a number of variants of packing laminate were developed. Such a packing laminate is known from, e.g., the international patent application with the publication number WO97/02140. The known packing laminate has a rigid but foldable base layer of paper or cardboard and outer moisture-proof coatings of moisture- and heat-resistant thermoplastic material on both sides of the base layer. In order to give the known packing laminate tightness properties even against gases, especially oxygen gas, the packing laminate also has a gas barrier, e.g., an aluminum foil, arranged between the base layer and the one outer layer.

Autoclavable packing containers are produced from the known packing laminate with the aid of packing machines of the type that form, fill and seal ready packings from a web or from pre-manufactured materials of packing laminate in accordance with the so-called form/fill/seal technique.

Autoclavable packing containers are produced from, e.g., a plane, foldable, tubular packing material of the known packing laminate in that the packing laminate is first raised to an open, tubular packing capsule that is closed at its one end by folding and sealing the connected, foldable end panels of the packing capsule in order form a mainly plane bottom closure. The packing capsule provided with a bottom is filled with the current filling material, e.g., a food, through its open end that is then closed by a further folding and sealing of the appropriate end panels of the packing capsule in

order to form a mainly plane top closure. The filled and closed, usually parallelepipedic packing container is then ready for a heat treatment in order to give the packaged food an extended shelf life in the unopened packing container.

However, it turned out that in some cases problems can nevertheless occur in that the packing absorbs moisture during the autoclaving process to such an extent that it's mechanical properties are negatively influenced. Such problems occur above all in the parts where the packing laminate has open edges. These open edges are found in most parallelepipedic packings along a longitudinal seam that extends along the packing's height as well as at the two ends of the packing. This problem is usually referred to as edge intake.

The above-cited problem can furthermore be accentuated in certain instances by the fact that paper-based packings often require a support pressure during the autoclaving process. The support pressure is the pressure that prevails in the autoclave and balances the inner pressure that occurs due to the heating of the product in the closed packing.

SUMMARY OF THE INVENTION

One problem of the present invention is to create a process for the heat treatment of a packing material by means of which paper-based packing laminate can be autoclaved and the so-called edge intake can be avoided or at least reduced.

The above-cited problem has been solved in accordance with the invention by a process comprising the measures: Placing a number of packings in an autoclave, setting the autoclave to a first pressure by supplying a gaseous pressurizing medium with a low moisture content, supplying a heating medium for heating the packing and the product packaged in the packing, raising the pressure in the autoclave to a second pressure in conjunction with supplying the heating medium, and lowering the pressure in the autoclave during the final stage of the heat treatment in such a manner that the pressure of the product packaged in the packing is higher than or the same as the pressure prevailing in the autoclave outside of the packing.

The edge intake can be eliminated or at least greatly reduced by controlling the pressure cooking, inflow of air and water vapor as well as pressure drops in the above-described manner. A plausible explanation that explains at least partially how this comes about is that by supplying air under pressure before the packing laminate is exposed to the moist water vapor the pores at the edges of the paper-based material are filled with compressed air. During the process this compressed air takes up a large part of the space in which vapor would otherwise be able to be pressed into. By controlling the pressure drop in the autoclave during the pressure drop so that the pressure in the autoclave is somewhat lower at every moment than the pressure in the pores of the packing material the uploaded air and possibly vapor that penetrated into the pores is pressed out of the pores.

Preferred embodiments of the invention follow from the subordinate patent claims.

According to a preferred embodiment this first pressure is at least approximately 1 bar, preferably approximately 2 bar or more preferably 3 bar. The higher the pressure before the vapor is introduced, the lower the obtained edge intake. However, it is difficult in most of the commercial autoclaves to obtain a pressure above approximately 2 bar before a part of the vapor must be introduced. How well the concept of the invention can be utilized therefore depends to a certain extent on what type of autoclave is used, but the most important thing is that the pores are at least "laddered" with air up to a certain pressure level.

According to a preferred embodiment this first pressure is approximately the same as this second pressure. By acting in this manner it is possible in principle to obtain a low flow of air from the pores of the packing during the entire time that the autoclaving is in operation.

This second pressure is advantageously on the magnitude of 3-6 bar, preferably approximately 4-5 bar. This pressure is selected so that the product is able to be sterilized to a certain level and that the packing can be given a sufficient support pressure during the autoclaving.

A simple manner of supplying the required amount of heat is to use water vapor as the cited heating medium.

SHORT DESCRIPTION OF THE DRAWINGS

The invention will be described in detail in the following with reference made to the attached schematic drawings that show an embodiment that is preferred for the present invention by way of example.

Fig. 1 basically shows how pressure and temperature vary in the autoclave over time.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

It should be noted in the following detailed description of a preferred embodiment that the selected level of the heat treatment is based among other things on under which conditions the product packed in the packing is to be stored. Thus, various temperatures, dwell times in the autoclave, pressure and other parameters will be described in conjunction with various types of packings, products and storage conditions.

A conventional storage-extending heat treatment of the packaged food can be readily carried out in the manner and under the conditions described in detail in the international patent application with the publication number WO98/16431, that is incorporated herewith as reference. It can be gathered from this reference how a conventional autoclaving process can be carried out. For the sake of clarity, this detailed description will be directed to a great extent to the specific characteristics that the invention will achieve. The parts of the technical construction that are commercially available will not be described in detail but reference is made to WO98/16431. The

invention described in the above can be used in various types of autoclaves. For the sake of clarity two main types of autoclave are to be cited that the invention is intended to be used with, namely those with a stationary product stand and those with a rotating product stand. A detailed description of these types is not necessary since both are commercially available and since the principle of the invention can be used for both types.

For further information on how a packing material is adapted for autoclaving, refer also to the international patent application with the publication number WO97/02140. This packing laminate has a rigid but foldable base layer of paper or cardboard and outer liquid-tight coatings of moisture-and heat-resistant thermoplastic material on both sides of the base layer. In order to give the known packing laminate tightness properties even against gases, especially oxygen gas, the packing laminate furthermore has a gas barrier, e.g., an aluminum foil, arranged between the base layer and the one outer coating.

Autoclavable packing containers are produced from this packing laminate with the aid of packing machines of the type that form, fill and seal ready packings from a web or from pre-manufactured materials of packing laminate in accordance with the so-called form/fill/seal technique.

Autoclavable packing containers are produced from, e.g., a plane, foldable, tubular packing material of the known packing laminate in that the packing laminate is first raised to an open, tubular packing capsule that is closed at its one end by folding and sealing the connected, foldable end

panels of the packing capsule in order form a mainly plane bottom closure. The packing capsule provided with a bottom is filled with the current filling material, e.g., a food, through its open end that is then closed by a further folding and sealing of the appropriate end panels of the packing capsule in order to form a mainly plane top closure. The filled and closed, usually parallelepipedic packing container is then ready for a heat treatment in order to give the packaged food an extended shelf life in the unopened packing container.

The filled packing container obtained in this manner is placed in an autoclave. Then, the pressure in the autoclave is raised by supplying a pressure-raising medium in the form of air with a low moisture content to the autoclave. The pressure in the autoclave is raised to a pressure of approximately 2 bar. Then, the heating begins with the aid of a circulating, gaseous heating medium, e.g., water vapor, to a temperature that is generally in a range of 70-130°C. In the described preferred embodiment the water vapor is supplied at a temperature of 140 since the temperature in the autoclave is maintained at a temperature of 20°C.

Then, the filling with compressed air and the supplying of the water vapor is continued so that the pressure in the autoclave is increased to approximately 4-5 bar. This takes approximately 4 minutes to achieve this pressure level. It turned out that in so-called rotating autoclaves, that is, autoclaves with a rotating product stand, approximately 5 bar is a suitable pressure whereas the suitable pressure for autoclaves with a stationary

product stand is almost approximately 4 bar. These pressure levels are approximately 1-1.5 bar higher than the pressure required so that the support pressure prevents the packings from bursting due to the inner product pressure. However, it should be noted that these pressure levels are based on products, type of packing, type of autoclave and desired sterility level. The pressure can vary, e.g., between 3-6 bar with a good results.

Water is also supplied via mouthpieces to the outside of the packings at the same time as the start of the supplying of vapor and while the product is maintained warm. This is done so that heat is distributed evenly over the load (all packings in the autoclave) in a rapid and simple manner.

After a predetermined dwell time at the selected temperature the supply of the gaseous medium is halted. The packing container is cooled thereafter with a circulating liquid temperature-lowering medium, e.g., temperature-controlled (colder) water. The cooled packing container is then removed from the autoclave for further transport and handling.

During this temperature drop the pressure in the autoclave drops as the temperature drops. The pressure drop is controlled so that the pressure in the packing material pores during the entire cooling is higher than or at least equal to the pressure prevailing in the autoclave at the outside of the packings.

The edge intake can be eliminated or at least greatly reduced by controlling the pressure cooking, inflow of air and water vapor as well as pressure drops in the above-described manner. A plausible explanation that

explains at least partially how this comes about is that by supplying air under pressure before the packing laminate is exposed to the moist water vapor the pores at the edges of the paper-based material are filled with compressed air. During the process this compressed air takes up a large part of the space in which vapor would otherwise be able to be pressed into. By controlling the pressure drop in the autoclave during the pressure drop so that the pressure in the autoclave is somewhat lower at every moment than the pressure in the pores of the packing material the uploaded air and possibly vapor that penetrated into the pores is pressed out of the pores.

Since the heat properties of the packing material and of the product are known, the pressure in the packings and the pressure in the pores of the packing material can be readily calculated by measuring the temperature on the outside of the packings. Alternatively, the connection between the temperature of the cooling medium and the temperature of the packing material can be tested in order to then measure the temperature of the cooling agent under normal operation of the autoclave. The exact method of monitoring and controlling the process is heavily based on what type of autoclave is being used and which commercial suppliers of autoclaves are engaged. Since this type of control of pressure and temperature in the autoclave and in the media supplied to the autoclave is available in commercially available autoclaves, this process control or process monitoring will not be described in detail. The selection and shaping of the

process control or process monitoring are also not important for carrying out the concept of the invention.

The only requirement that should be posed for the concept of the invention is that air can be supplied initially at a special pressure in that during the cooling the pressure can be lowered in a controlled manner so that the pressure can be lowered somewhat more rapidly than the pressure in the packagings and the pressure in the pores in the packaging material dependent on it drop.

As previously stated, the total treatment time including the time for heating up and the time for cooling from the selected treatment temperature should be sufficient so that in each individual case the current food has a combination of high FO value and a low CO value. The expressions "FO value" and "CO value" are known for a person skilled in the art and refer to the time (min) that the food needs to be heated and the reference temperature (120°C) for achieving the same level of stability respectively the time the food should be warmed at a reference temperature (100°C) in order to achieve the same level of cooking effect on all the components of the food.

The above-described process can yield a system in which the pressure in the packing material pores is higher than the pressure in the autoclave, that for its part is higher than the product pressure against the packing. The initial setting of the pressure by air brings it about that the pores gain an advantage in the pressurizing that then increases with the pressurizing and the heating of the environment in the autoclave.

It is apparent that a plurality of modifications of the embodiments of the invention described here are possible within the scope of the invention, that is defined in the following patent claims.

CLAIMS

1. A process for the heat treatment of a packing, comprising the measures:

Of placing a number of packings in an autoclave,

Of pressurizing the autoclave to a first pressure by supplying a gaseous pressurizing medium with a low moisture content such as air or the like,

Of supplying a heating medium for heating the packing and the product packaged in the packing,

Of raising the pressure in the autoclave to a second pressure in conjunction with supplying the heating medium, and

Of lowering the pressure in the autoclave during the final stage of the heat treatment in such a manner that the pressure of the product packaged in the packing is higher than or the same as the pressure prevailing in the autoclave outside of the packing.

2. The process according to Claim 1, in which this first pressure is at least approximately 1 bar, preferably approximately 2 bar, or more preferably 3 bar.

3. The process according to Claim 1, in which this first pressure is approximately the same as this second pressure.

4. The process according to one of the previous claims, in which this second pressure is on the order of 3-6 bar, preferably 4-5 bar.

5. The process according to one of the previous claims, in which this heating medium is water vapor.

6. The process according to Claim 5, that furthermore comprises measures for supplying water via a number of mouthpieces to the outside of the packings.

7. The process according to one of the previous claims, comprising measures for selecting a packing of a paper-based packing laminate as packing.

ABSTRACT

The present invention relates to a process for the heat treatment of a packing, comprising the measures: Of placing a number of packings in an autoclave, pressurizing the autoclave to a first pressure by supplying a gaseous pressurizing medium with a low moisture content, supplying a heating medium for heating the packing and the product packaged in the packing, raising the pressure in the autoclave to a second pressure in conjunction with supplying the heating medium, and of lowering the pressure in the autoclave during the final stage of the heat treatment in such a manner that the pressure of the product packaged in the packing is higher than or the same as the pressure prevailing in the autoclave outside of the packing.

Publication image: Fig. 1

Fig. 1

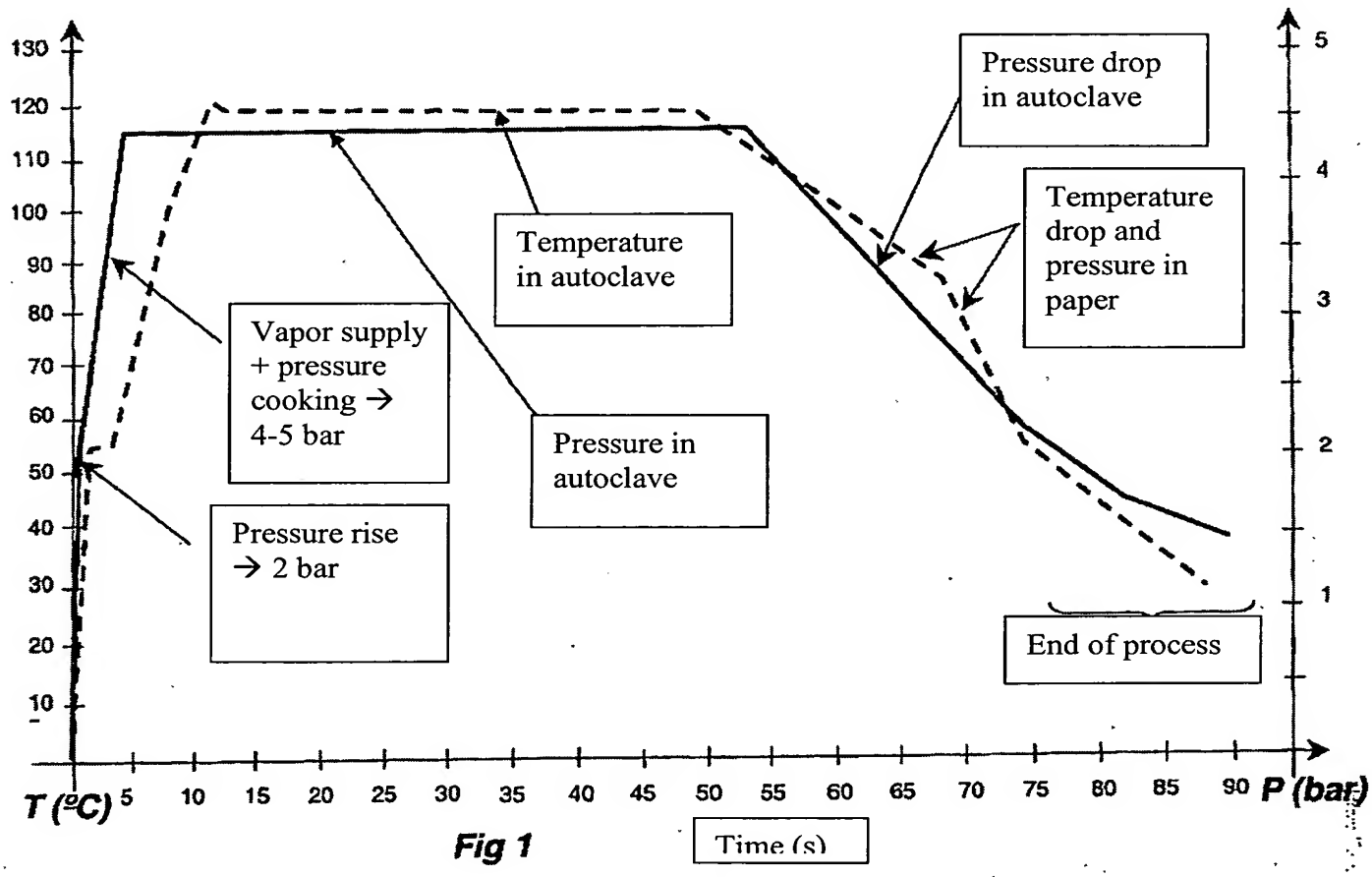
130
120
110
100
90
80
70
60
50
40
30
20
10
T (°C)
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
P (bar)
5
4
3
2
1
Time (s)
Pressure drop in autoclave
Temperature drop and pressure in paper
Temperature in autoclave
Vapor supply + pressure cooking → 4-5 bar
Pressure in autoclave
Pressure rise → 2 bar
End of process

Fig 1